

Five myths about diesel engines

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Argonne mechanical engineer Steve Ciatti takes a crack at some of the more persistent myths surrounding the technology of diesel engines. Credit: Argonne National Laboratory

(PhysOrg.com) -- Diesel engines, long confined to trucks and ships, are garnering more interest for their fuel efficiency and reduced carbon dioxide emissions, relative to gasoline engines. Argonne mechanical engineer Steve Ciatti takes a crack at some of the more persistent myths surrounding the technology.

Myth #1: Diesel is dirty.

"We all have this image of trucks belching out dirty black smoke," Ciatti said. This smoke is [particulate matter](#) from [diesel exhaust](#): soot and small amounts of other chemicals produced by the engine.

But EPA emissions requirements have significantly tightened, and [diesel engines](#) now have to meet the same criteria as gasoline engines. They do this by adding a Diesel Particulate Filter (DPF), which removes visible smoke. "DPFs are very effective," Ciatti said. "They remove 95-plus percent of the mass of smoke."

The smoke, trapped in a ceramic matrix, accumulates until the car's computer determines it's time to clean it out in a process called a

"regeneration cycle."

While running, a small amount of extra [fuel](#) is added to the combustion chambers in the engine; the resulting heat and oxygen activate a catalyst in the DPF to burn off the accumulated [soot](#). This renders a small [fuel consumption](#) penalty.

"Visible smoke is essentially gone, as of the 2007-2010 regulations," Ciatti said. "If you're buying a diesel car from 2007 or later, it's no dirtier than a gasoline-powered vehicle."

And in the invisible range -- diesel engines actually emit less carbon dioxide than gasoline engines do.

Myth #2: Diesel engines won't start in the winter.

"Today's technologies for cold-start are very effective," Ciatti said. "Modern diesel engines start in cold weather with very little effort."

The problem is that diesel jells at low temperatures. Below about 40°F, certain hydrocarbons in diesel turn gelatinous. "Since an engine depends on aerosolizing fuel, you don't want goopy fuel," Ciatti explained.

Often this is remedied with glow plugs, which are heated by the battery and help warm up the fuel so it can vaporize.

Low temperatures aren't a problem for gasoline engines because gasoline is much more flammable than diesel. Even at room temperature and pressure, gasoline is partly vapor. "Toss a match into a pool of gasoline, and the match will never even hit the surface of the liquid; it will ignite the layer of vapor above the pool," Ciatti said. "That's why gasoline has to be handled extremely carefully around any ignition source. Diesel isn't so volatile; if you tossed that match into a pool of diesel, it would go out."

Glow plugs and other remedies, however,

effectively vaporize diesel to prepare it for combustion.

Myth #3: Diesel cars don't perform well.

Because diesel engines are still most common in trucks, many people assume that diesel-powered cars would behave like a truck behaves: slow and sluggish. "But keep in mind, that truck's likely hauling around 50 tons," Ciatti said. "In fact, to some degree, some people who drive diesels find they perform better than gasoline engines."

That's because diesel-powered engines get their best power when the engine's revolutions per minute (RPM) are low -- that is, at speeds below 65 miles per hour, where most driving takes place. Gasoline engines, in contrast, get to peak power by running the engine very high and fast; a gasoline car only reaches its peak horsepower with the accelerator pedal to the floor and the engine running at 5,000 RPM.

"Diesel car performance is far better than the perceived horsepower rating, because you're getting all that power at speeds where you actually drive the vehicle," Ciatti said. "You've got more pulling power and more acceleration at those speeds."

Myth #4: You can't find diesel at the pump.

Diesel-powered pickups and cars are popular enough that the market has taken interest; most neighborhood gas stations now have automotive diesel pumps.

"I drove a diesel car myself for 10 years. I can count on one hand the number of times I had to actually search for a pump," Ciatti said.

Myth #5: Diesel fuel is more expensive than gasoline.

Though Chicagoland diesel prices are generally higher than gasoline, in most parts of the country, diesel fuel and gasoline are priced comparably. Today, Illinois taxes diesel at higher rates than gasoline.

"Diesel fuel is not more expensive to produce than gasoline," Ciatti explained. "Its price usually has to do with the local tax structure."

Bonus: One thing you may not know about diesel!

Diesel engines actually perform better at high altitudes than gasoline engines.

Why? Gasoline engines operate at a very specific ratio of fuel and air. At high altitudes, the air is thinner--literally: there are fewer molecules of air per cubic foot. In the mountains, then, gasoline engines have to add less fuel to keep the ratio perfect, which affects performance.

"But a diesel engine runs fuel-lean; you don't have to keep the ratio perfect," Ciatti said. Diesel engines have turbochargers, which are pumps driven by exhaust gas. They add more air to the combustion chamber, and more air means more fuel can be added. At altitude, it can pull in more air and more fuel, and thus gets more power than gasoline engines can. Turbochargers don't use extra energy; they run off thermodynamically "free" energy that would be lost as exhaust if not used.

"Drive a [diesel](#) at altitude and you'll see other cars struggling while you zip past," Ciatti said. "The effect is very noticeable."

Provided by Argonne National Laboratory

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